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Original Paper

Collaborative Exploration of Plant Genetic Resources in Northern Cambodia, 2018

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Summary

Under the Plant Genetic Resources in Asia (PGRAsia) project, the National Agriculture and Food Research Organization (NARO) and the Cambodian Agricultural Research and Development Institute (CARDI) have conducted several collaborative explorations of plant genetic resources in Cambodia since 2014. As a part of these explorations, in October 2018, we conducted a field survey in Northern Cambodia, including Oddar Meanchey and Preah Vihear Provinces. During the field survey, we collected a total of 118 plant genetic resources, including 54 of Solanaceous accessions (chili pepper and eggplant), 40 Cucurbitaceous accessions (squash, cucumber, melon, gourd, etc.), and 12 of Fabaceous accessions. The collected seeds were equally transferred to the Genebank in NARO and CARDI.

KEY WORDS: Cambodia, chili pepper, eggplant, squash

Introduction

Plant genetic resources are significantly important for breeding programs because of their superior traits such as disease resistance and interesting morphological characteristics. In 2014, the Plant Genetic Resources in Asia (PGRAsia) project was launched by the collaboration between the National Agriculture and Food Research Organization (NARO) and the Genebanks in Asian countries to facilitate the utilization of plant genetic resources. Under this project, the NARO and the Cambodian Agricultural Research and Development Institute (CARDI) have conducted several collaborative explorations in Cambodia. The previous explorations were initially performed in western and northwest areas (Matsunaga *et al.* 2015; Takahashi *et al.* 2015); subsequently, eastern areas were explored (Tanaka *et al.* 2016; Sreynech *et al.* 2017; Matsushima *et al.* 2018). In these areas, more than 300 plant genetic resources, mainly Solanaceous and Cucurbitaceous vegetables, were collected. Conversely, Sugita *et al.* (2017) and Tanaka *et al.* (2017) explored the northern area and found almost 200 accessions of chili pepper and Cucurbitaceous plants, respectively. However, the number of collected samples in the northern area was relatively less than that in the western and northwestern or eastern areas. Hence, the northern area deserved to be explored to collect more plant genetic resources. Recently, local varieties in Cambodia are being replaced by developed ones derived from neighboring countries, and hence, they need to be preserved before the local varieties disappear. Therefore, the present field survey was conducted to collect more plant genetic resources, mainly Solanaceous and Cucurbitaceous plants, from Northern Cambodia, including Oddar Meanchey and Preah Vihear Provinces.

Methods

A field survey was conducted in Odder Meanchey and Preah Vihear Provinces in Northern Cambodia from October 2 to 12, 2018 (Table 1, Fig. 1). In the survey, we explored plant genetic resources, mainly Solanaceous and Cucurbitaceous plants. We used two cars for transport and stopped at farmers' houses. Seed and fruit samples were collected from farmers' storages, backyards, or fields (Photos 1–4). While collecting samples, we always asked the local farmers about the origin of the samples. We did not collect developed varieties and only collected local varieties. For each sample, local name, utilization, and characteristics were recorded by interview and observation. In addition, we recorded the place name, characteristics of collection sites, and tribal names. The latitudes, longitudes, and altitudes of each collection site were also recorded using the Garmin eTrex20J GPS technology (Garmin International Inc.,

Table 1. Itinerary plan followed during the 2018 survey in Northern Cambodia

Date	Day	Itinerary	Stay
2-Oct	Wed	Narita 10:50 (NH817) -- 15:10 Phnom Penh	Phnom Penh
3-Oct	Thu	Visit CARDI	Phnom Penh
4-Oct	Fri	Phnom Penh -- Siem Reap	Siem Reap
5-Oct	Sat	Siem Reap -- Preah Dak -- Tbeang -- Anlong Veng	Anlong Veng
6-Oct	Sun	Anlong Veng -- Trapeang Prasat -- Samrong	Samrong
7-Oct	Mon	Samrong -- Choam Khsant -- Tbaeng Meanchey -- Pou --Tbeang Meanchey	Tbaeng Meanchey
8-Oct	Tue	Tbaeng Meanchey -- Cheb -- Tbaeng Meanchey -- Kulen -- Tbeang Meanchey	Tbaeng Meanchey
9-Oct	Wed	Tbaeng Meanchey -- Bos Poy -- Sambour -- Kampong Thom	Kampong Thom
10-Oct	Thu	Kampong Thom -- Phnom Penh	Phnom Penh
11-Oct	Fri	Visit CARDI and arrange the collected seeds	Phnom Penh
12-Oct	Sat	Visit Central Market, Russian Market and AEON MALL Phnom Penh 22:50 (NH818) -- 06:45 Narita (Next morning)	

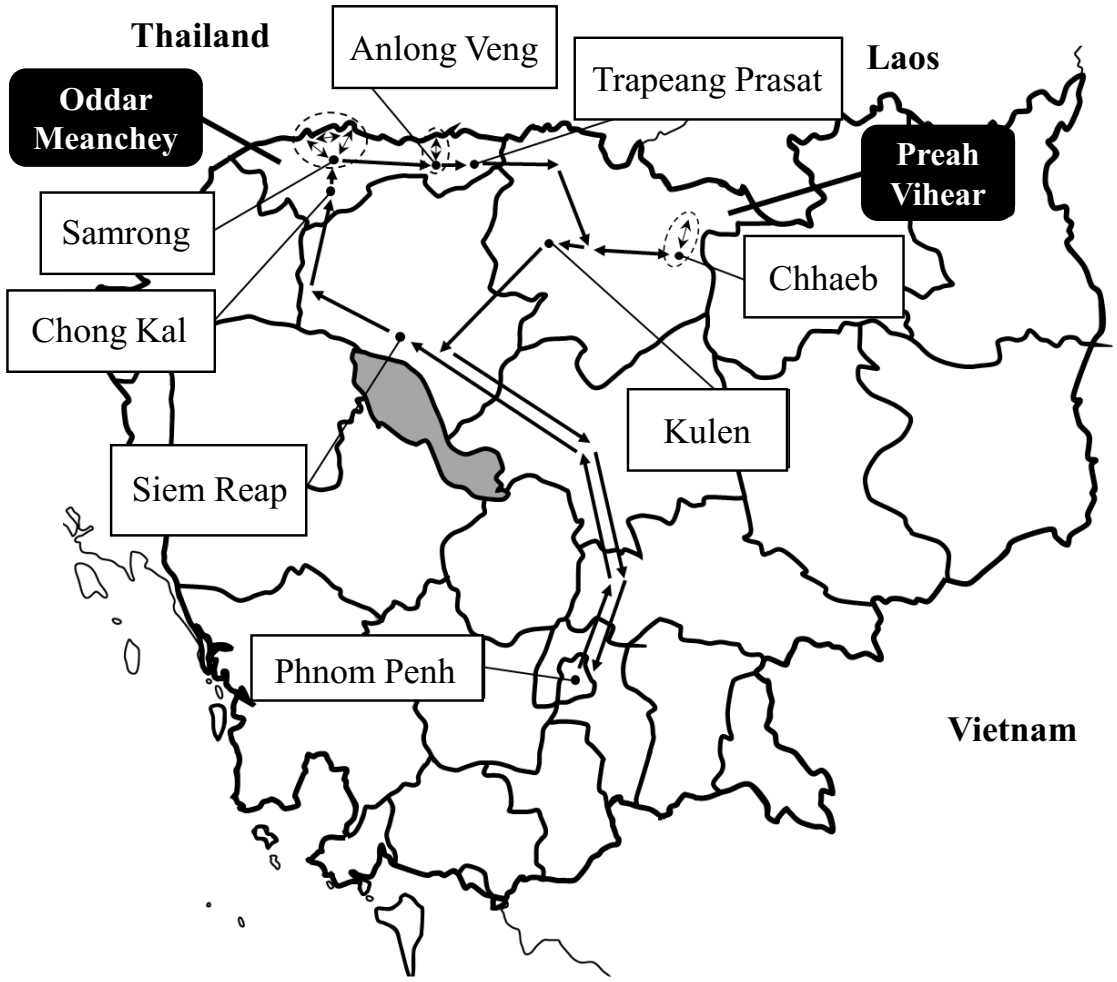

Fig. 1. Exploration route and collection sites of the field survey in Northern Cambodia in 2018.

Olathe, KS, USA). The seed samples were directly kept in envelopes. In contrast, for the fruit samples, seeds were extracted from the fruits and kept in envelopes after drying.

Results and Discussion

In the present field survey, a total of 118 seed and fruit samples were collected from Oddar Meanchey and Preah Vihear Provinces in Northern Cambodia (Table 2). The total accessions included 37 of *Capsicum* spp., 17 of *Solanum* spp., 40 of Cucurbitaceous crops, 12 of Fabaceous crops, and 37 of others. Fruit samples were mainly collected from farmers' backyards, whereas seed samples were mainly collected from storages in farmers' houses; farmers usually preserved the seeds in plastic bottles or net bags. After the field survey, the collected seed samples were equally shared between the NARO and CARDI.

Exploration site

1. Oddar Meanchey province (October 5 to 7)

On October 5, we moved to Oddar Meanchey Province from Siem Reap Provinces and explored from Prey Thom village in Chong Kal district. Subsequently, we visited Bansay Rak, Kok Chan Rey, and Pomg villages in Samrong district. On the sixth day, we conducted exploration in Samrong district and visited Porl and Thnol Bort villages. Next, we moved to Srass Chhouk and Choeng Phnom villages

in Anlong Veng district. On October 7, we left Anlong Veng district and arrived at Chey Nivat village in Trapeang Prasat district.

2. Preah Vihear province (October 8 to 9)

After moving to Preah Vihear Province from Oddar Meanchey Province, we began our field survey on October 8; we visited Kdul, Chheab Lech, and Dong Phlat villages in Chhaeb district. On October 9, we visited Pong village in Kulen district.

In Oddar Meanchey Province, we collected a total of 73 samples, including 24 of chili peppers, 10 of eggplants, six of squashes, and five of sponge gourds. In Preah Vihear Province, a total of 45 samples, including 13 of chili peppers, seven of eggplants, five of squashes, and six of melons, were collected. The complete list of collected samples is available in Table 2, and the pictures of the samples are listed at the end of this article.

Table 2. Samples collected during the 2018 survey in Northern Cambodia

			Province		
Family	Genus	Species	Oddar Meanchey	Preah Vihear	Total
Amaranthaceae	*Amaranthus*	*blitum*	2	1	3
		cruentus	0	1	1
Cucurbitaceae	*Benincasa*	*hispida*	3	1	4
	Citrullus	*lanatus*	2	1	3
	Cucurbita	*moschata*	6	5	11
	Cucumis	*melo*	3	6	9
		sativus	2	1	3
	Lagenaria	*siceraria*	2	0	2
	Luffa	*acutangula*	1	0	1
		cylindrica	5	0	5
	Momordica	*charantia*	1	0	1
	Trichosanthes	*cucumerina*	1	0	1
Fabaceae	*Canavalia*	*gladiata*	1	0	1
	Glycine	*max*	1	0	1
	Lablab	*purpureus*	1	0	1
	Psophocarpus	*tetragonolobus*	2	0	2
	Vigna	*umbellata*	0	2	2
		unguiculata	2	3	5
Malvaceae	*Abelmoschus*	*esculentus*	2	0	2
Passifloraceae	*Passiflora*	*passiflora*	1	0	1
Poaceae	*Setaria*	*italica*	0	1	1
	Sorghum	*bicolor*	0	2	2
	Zea	*mays*	1	1	2
Solanaceae	*Capsicum*	*annuum*	9	2	11
		frutescens	15	11	26
	Solanum	*melongena*	9	7	16
		torvum	1	0	1
Total			73	45	118

Collected plant genetic resources

1) Chili pepper

In the present field survey, a total of 37 chili peppers, including 11 of *Capsicum annuum* L. and 26 of *Capsicum frutescens* L., were collected. Globally, there are five domesticated species of chili pepper: *C. annuum*, *C. frutescens*, *C. chinense*, *C. baccatam*, and *C. pubescens*. However, only *C. annuum* and *C. frutescens* were observed in the surveyed areas. This result was identical with that of previous studies (Matsunaga *et al.* 2015, 2018; Tanaka *et al.* 2016; Sugita *et al.* 2017; Matsushima *et al.* 2018). Hence, *C. chinense*, *C. baccatam*, and *C. pubescens* may not be cultivated in Cambodia.

Most of the collected 11 *C. annuum* accessions were assigned to elongated fruit type called "Mate" or "Mate Dai Neang" in Khmer. In Cambodia, chili pepper is called "Mate" (chili pepper) or "Mate" with additional words that mainly indicate the characteristic of fruits (Tanaka *et al.* 2016). "Mate Dai Neang" is one of the examples, which means "ring finger," metaphorically describing the characteristic of the elongated fruit shape. According to a previous field survey in Cambodia, "Mate Dai Neang" is widely and commonly used for *C. annuum* with elongated fruit shape. Therefore, "Mate Dai Neang" is thought to be the most popular type of *C. annuum*. The elongated type of chili peppers had pungency, and local farmers usually used them for making pickles, soup, or salted fish guts called "Prahok." Conversely, we also observed chili peppers with round fruit shape called "Mate Lev Ouv" (Nos. 71 and 72) in Khmer. "Lev Ouv" means cloth's button and refers to the small and rounded green fruits. Although chili peppers in northern Cambodia have already been explored by Sugita *et al*. (2016), these rounded fruit type have never reported yet; to our knowledge, this is the first report describing the collection of such new type of variety. Local farmers informed that the pungency of "Mate Lev Ouv" is lower than that of "Mate Dai Neang"; therefore, they did not use them as spice, but as vegetable for soup (Photo 6).

Most of the collected 26 accessions of *C. frutescens* were called "Mate Ach Sath" ("bird's dropping") or "Mate Sor" ("white") in Khmer. As described by previous studies, we also observed "Mate Ach Sath" had very short and small fruits, and "Mate Sor" had horn shaped and yellowish immature fruits. Of the 211 *C. frutescens* collected in Cambodia (2014–2018), 84 and 44 were called "Mate Ach Sath" and "Mate Sor," respectively. This result suggested that "Mate Ach Sath" is the most dominant type of *C. frutescens*, followed by "Mate Sor," in Cambodia. Their local utilization was almost the same as that of "Mate Dai Neang," as mentioned above; moreover, local farmers eat fresh fruits with rice noodle called "Quituvul." Conversely, in the present survey, we confirmed that some *C. frutescens* accessions were called other local names except for "Mate Ach Sath" or "Mate Sor." "Mate Chma" (small) had "Mate Ach Sath"-like fruits, whereas, "Mate Quituvul" (Cambodian rice noodle) and "Mate La Add" had "Mate Sor"-like fruits. In addition, we found another *C. frutescens* accession called "Mate Dai Neang," although this name was used for *C. annuum* with elongated fruits.

2) Eggplant

We collected a total of 17 accessions of eggplant, including 16 accessions of *Solanum melongena* L. and another accession of *Solanum torvum* Swartz. Most *S. melongena* accessions had small rounded fruits with green stripes on light green or white colored pericarp, as described by Matsunaga *et al.* (2015). However, only No. 80 showed purple fruit color, and No. 81 had extremely large fruits. During the exploration and interview of local farmers, we found two unique eggplant accessions (Nos. 44 and 98). No. 44 had small rounded fruits as mentioned above, but this accession had superior tolerance to drought stress.

In addition, this accession was used as a medicine. When local people have nail injury, they place their fingers into its pulp to alleviate the symptoms. In contrast, No. 98 is a morphologically unique accession and has green jelly-like pulp like tomato (*S. lycopersicum*). Although these interesting traits in Nos. 44 and 98 need to be investigated in detail by cultivation, these accessions might be useful for the breeding of drought-resistant variety or eggplants with novel characteristics.

3) Cucurbitaceous accessions

In the present survey, a total of 40 Cucurbitaceous accessions were collected. Among the collected samples, 12 accessions were of *Cucumis*; nine were melon, three were cucumber, and 11 were squash. In addition, we collected wax gourd (four accessions); watermelon (three accessions); bottle gourd (two accessions); sponge gourd (five accessions); and ridged gourd, bitter gourd, and snake gourd (one accession each). Many squashes were collected in this survey; they were identified as *Cucurbita moschata* Duch based on the morphological characteristics of the fruits (Photo 5). Most squash accessions had flat shape and usual sized fruit (fruit length, approximately 30 cm). However, No. 2 had very large fruit (fruit length, about 40 cm); this accession could be used for breeding large-size squashes. In addition, we found butternut squash (No. 82). These fruits are known to be very sticky and often used for making custard pudding cake. For melon and cucumber, we mostly collected seed samples preserved at farmers' storage, and hence, we could not observe the morphological traits of the fruits. In the case of sponge gourd, the seeds were preserved in the dried fruit; we could investigate the fruit shape and size, although fresh fruits were not collected. Most of the sponge gourd accessions had elongated shape (approximately 40 cm long). In particular, the fruit of No. 26 was very long (87 cm), and this accession could be useful for genetic analysis regarding fruit length of sponge gourd. These sponge gourds were not used as sponge, but as vegetable for making soup or Nam phrik.

4) Fabaceous accessions

We collected a total of 12 Fabaceous accessions, including five accessions of cowpea; two accessions of rice bean; two accessions of winged bean; and one accession each of soybean, hyacinth bean, and sword bean. Interestingly, for cowpea, one farmer preserved both seeds of cowpeas (Nos. 104 and 105) and rice beans (Nos. 106 and 107) in the same plastic bag. They cultivated and preserved cowpea and rice beans together, although their usage for cooking was different.

In addition to Solanaceous, Cucurbitaceae, and Fabaceous plants, we also collected 12 other accessions: Amaranthus (four accessions), okra (two accessions), maize (two accessions), sorghum (two accessions), foxtail millet (one accession), and bush passion fruit (one accession). Initially, the present survey was launched to explore mainly Solanaceous and Cucurbitaceae plants. However, many kinds of local plants were collected, unexpectedly. This result suggested that local farmers cultivate local plants for their own utilization. In conclusion, the collected plant genetic resources might be useful materials for further breeding programs or agricultural researches.

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北カンボジアにおける植物遺伝資源の共同探索，2018 年

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和文摘要

本報告は農林水産省委託プロジェクト研究「海外植物遺伝資源の民間等への提供促進」の予算を用いて行われた北カンボジアにおける遺伝資源探索・収集に関する報告書である．本調査は国立研究開発法人農業・食品産業技術総合研究機構（NARO）遺伝資源センターとカンボジア農業開発研究所（Cambodian Agricultural Research and Development Institute; CARDI）間で締結された共同研究協定に基づいて 2018 年 10 月 2 日～ 10 月 12 日に実施された．調査ではカンボジア北部のウドンメンチェイ州とプレアヴィヒア州を探索し，現地農家が貯蔵していた種子をはじめ，裏庭や農場で栽培されていた植物個体から果実の収集を行った．調査の結果，ナス科（トウガラシおよびナス）54 点，ウリ科（カボチャ，キュウリ，メロン，ヘチマ等）40 点ならびにマメ科（ササゲ等）12 点等を含む合計 118 点の植物遺伝資源が収集された．収集された植物遺伝資源の種子は 2 等分し，NARO のジーンバンクと CARDI にそれぞれ移送され，利用可能な植物遺伝資源として保存される．

Table 3. List of collected plant genetic resources in northern Cambodia in 2018

JP No.	Individual No.	Date	Province	District	Commune	Village	Latitude	Longtitude	Altitude (m)	Species name	Local name	Source	Tribe
269410	1	5-Oct	Oddar Meanchey	Chong Kal	Chong Kal	Prey Thom	N13-56-52.4	E103-34-14	29	*Luffa cylindrica*	No Nong	Farmer's house	Khmer
269411	2	5-Oct	Oddar Meanchey	Chong Kal	Chong Kal	Prey Thom	N13-56-54.1	E103-34-15.3	33	*Cucurbita moschata*	Lpov	Farmer's house	Khmer
269412	3	5-Oct	Oddar Meanchey	Chong Kal	Chong Kal	Prey Thom	N13-56-54.1	E103-34-15.3	33	*Solanum melongena*	Trob Sroy	Farmer's backyard	Khmer
269413	4	5-Oct	Oddar Meanchey	Chong Kal	Chong Kal	Prey Thom	N13-56-54.1	E103-34-15.3	33	*Lagenaria siceraria*	Khlok	Farmer's house	Khmer
269414	5	5-Oct	Oddar Meanchey	Chong Kal	Chong Kal	Prey Thom	N13-56-54.1	E103-34-15.3	29	*Luffa cylindrica*	No Nong	Farmer's house	Khmer
269415	6	5-Oct	Oddar Meanchey	Chong Kal	Chong Kal	Prey Thom	N13-56-54.1	E103-34-15.3	33	*Cucumis sativus*	Tra Sork Srav	Farmer's house	Khmer
269416	7	5-Oct	Oddar Meanchey	Chong Kal	Chong Kal	Prey Thom	N13-56-54.1	E103-34-15.3	33	*Citrullus lanatus*	Orv Leuk	Farmer's house	Khmer
269417	8	5-Oct	Oddar Meanchey	Chong Kal	Chong Kal	Prey Thom	N13-56-54.1	E103-34-15.3	33	*Vigna unguiculata*	Sandeak Kour	Farmer's house	Khmer
269418	9	5-Oct	Oddar Meanchey	Chong Kal	Chong Kal	Prey Thom	N13-56-54.1	E103-34-15.3	33	*Amaranthus blitum*	Ptee	Farmer's backyard	Khmer
269419	10	5-Oct	Oddar Meanchey	Samrong	Bansay Rak	Bansay Rak	N14-13-59.8	E103-27-54.3	55	*Capsicum frutescens*	Mate Ach Sath	Farmer's backyard	Khmer
269420	11	5-Oct	Oddar Meanchey	Samrong	Bansay Rak	Bansay Rak	N14-13-59.8	E103-27-54.3	55	*Capsicum frutescens*	Mate Sor	Farmer's backyard	Khmer
269421	12	5-Oct	Oddar Meanchey	Samrong	Bansay Rak	Bansay Rak	N14-13-59.8	E103-27-54.3	55	*Passiflora passiflora*	Sav Mao Prey	Farmer's backyard	Khmer
269422	13	5-Oct	Oddar Meanchey	Samrong	Bansay Rak	Bansay Rak	N14-14-27.5	E103-27-49.2	58	*Capsicum frutescens*	Mate Ach Sath	Farmer's backyard	Khmer
269423	14	5-Oct	Oddar Meanchey	Samrong	Bansay Rak	Bansay Rak	N14-14-27.5	E103-27-49.2	58	*Cucurbita moschata*	Lpov Marik	Farmer's house	Khmer
269424	15	5-Oct	Oddar Meanchey	Samrong	Bansay Rak	Sombor Mas	N14-16-03.9	E103-27-37.4	63	*Solanum melongena*	Trob Rom	Farmer's backyard	Khmer
269425	16	5-Oct	Oddar Meanchey	Samrong	Kokrel	Kok Chan Rey	N14-21-55.2	E103-32-48.4	86	*Vigna unguiculata*	Sandeak Kour	Farmer's house	Khmer
269426	17	5-Oct	Oddar Meanchey	Samrong	Kokrel	Kok Chan Rey	N14-21-42.8	E103-32-47.5	83	*Solanum melongena*	Trob Sroy	Farming field	Khmer
269427	18	5-Oct	Oddar Meanchey	Samrong	Kokrel	Kok Chan Rey	N14-21-42.8	E103-32-47.5	83	*Luffa acutangula*	Nonong Chrong	Farming field	Khmer
269428	19	5-Oct	Oddar Meanchey	Samrong	Kokrel	Kok Chan Rey	N14-21-54.3	E103-32-51.0	83	*Abelmoschus esculentus*	Poot Barang	Farmer's backyard	Khmer
269429	20	5-Oct	Oddar Meanchey	Samrong	Kokrel	Porng	N14-20-40.5	E103-39-00	76	*Solanum torvum*	Trob Pot Nyom	Farmer's backyard	Khmer
269430	21	5-Oct	Oddar Meanchey	Samrong	Kokrel	Porng	N14-20-40.5	E103-39-00	76	*Cucumis melo*	Tra Sork Srav Thom	Farmer's backyard	Khmer
269431	22	5-Oct	Oddar Meanchey	Samrong	Kokrel	Porng	N14-20-38.2	E103-39-4.6	76	*Cucumis sativus*	Tra Sork Srav Toeh	Farming field	Khmer
269432	23	5-Oct	Oddar Meanchey	Samrong	Kokrel	Porng	N14-20-38.2	E103-39-4.6	76	*Cucumis melo*	Tra Sork Srav	Farming field	Khmer
269433	24	5-Oct	Oddar Meanchey	Samrong	Kokrel	Porng	N14-20-38.2	E103-39-4.6	76	*Capsicum frutescens*	Mate Ach Sath	Farming field	Khmer
269434	25	5-Oct	Oddar Meanchey	Samrong	Kokrel	Porng	N14-20-38.2	E103-39-4.6	76	*Citrullus lanatus*	Vang Ourak	Farming field	Khmer
269435	26	6-Oct	Oddar Meanchey	Samrong	Samrong	Porl	N14-11-35.3	E103-31-46.4	62	*Luffa cylindrica*	Nonong Veng	Farming backyard	Khmer
269436	27	6-Oct	Oddar Meanchey	Samrong	Samrong	Porl	N14-11-35.3	E103-31-46.4	62	*Luffa cylindrica*	Kro Orb	Farming backyard	Khmer
269437	28	6-Oct	Oddar Meanchey	Samrong	Samrong	Porl	N14-11-35.3	E103-31-46.4	62	*Benincasa hispida*	Troo Lach	Farming backyard	Khmer
269438	29	6-Oct	Oddar Meanchey	Samrong	Samrong	Porl	N14-11-35.3	E103-31-46.4	62	*Capsicum annuum*	Mate	Farming backyard	Khmer
269439	30	6-Oct	Oddar Meanchey	Samrong	Samrong	Porl	N14-11-35.3	E103-31-46.4	62	*Capsicum annuum*	Mate	Farmer's backyard	Khmer
269440	31	6-Oct	Oddar Meanchey	Samrong	Samrong	Porl	N14-11-35.3	E103-31-46.4	62	*Capsicum annuum*	Mate	Farmer's backyard	Khmer
269441	32	6-Oct	Oddar Meanchey	Samrong	Samrong	Porl	N14-11-35.3	E103-31-46.4	62	*Capsicum frutescens*	Mate Ach Sath	Farmer's backyard	Khmer
269442	33	6-Oct	Oddar Meanchey	Samrong	Samrong	Porl	N14-11-23.9	E103-31-40.9	49	*Trichosanthes cucumerina*	Nonong Poss	Farmer's backyard	Khmer
269443	34	6-Oct	Oddar Meanchey	Samrong	Samrong	Porl	N14-11-23.9	E103-31-40.9	49	*Amaranthus blitum*	Ptee	Farmer's backyard	Khmer
269444	35	6-Oct	Oddar Meanchey	Samrong	Samrong	Porl	N14-11-23.9	E103-31-40.9	49	*Capsicum frutescens*	Mate Sor	Farmer's house	Khmer
269445	36	6-Oct	Oddar Meanchey	Samrong	Samrong	Porl	N14-11-24.0	E103-31-40.1	50	*Capsicum frutescens*	Mate Ach Sath	Farmer's backyard	Khmer
269446	37	6-Oct	Oddar Meanchey	Samrong	Samrong	Porl	N14-11-24.0	E103-31-40.1	50	*Psophocarpus tetragonolobus*	Popeay	Farmer's backyard	Khmer
269447	38	6-Oct	Oddar Meanchey	Samrong	Samrong	Porl	N14-11-24.0	E103-31-40.1	50	*Capsicum frutescens*	Mate Ach Sath	Farmer's backyard	Khmer
269448	39	6-Oct	Oddar Meanchey	Samrong	Konkrel	Thnol Bort	N14-14-27.2	E103-34-4.5	56	*Benincasa hispida*	Tror Lach	Farmer's backyard	Khmer
269449	40	6-Oct	Oddar Meanchey	Samrong	Konkrel	Thnol Bort	N14-14-27.2	E103-34-4.5	56	*Cucurbita moschata*	Lpoa	Farmer's house	Khmer
269450	41	6-Oct	Oddar Meanchey	Samrong	Konkrel	Thnol Bort	N14-14-29.7	E103-34-3.2	56	*Solanum melongena*	Trob Sroy	Farmer's backyard	Khmer

Table 3. (Continued).

JP No.	Individual No.	Date	Province	District	Commune	Village	Latitude	Longtitude	Altitude (m)	Species name	Local name	Source	Tribe
269451	42	6-Oct	Oddar Meanchey	Samrong	Konkrel	Thnol Bort	N14-14-29.7	E103-34-3.2	56	*Solanum melongena*	Trob Veng	Farmer's backyard	Khmer
269452	43	6-Oct	Oddar Meanchey	Samrong	Konkrel	Thnol Bort	N14-14-29.7	E103-34-3.2	56	*Solanum melongena*	Trob Sroy	Farmer's backyard	Khmer
269453	44	6-Oct	Oddar Meanchey	Samrong	Konkrel	Thnol Bort	N14-14-29.7	E103-34-3.2	56	*Solanum melongena*	Trob Car	Farmer's backyard	Khmer
269454	45	6-Oct	Oddar Meanchey	Samrong	Konkrel	Thnol Bort	N14-14-24.3	E103-34-5.7	57	*Cucurbita moschata*	Lpoa Sa At	Farmer's backyard	Khmer
269455	46	6-Oct	Oddar Meanchey	Samrong	Konkrel	Thnol Bort	N14-14-24.3	E103-34-5.7	57	*Capsicum frutescens*	Mate Sor	Farmer's backyard	Khmer
269456	47	6-Oct	Oddar Meanchey	Samrong	Konkrel	Thnol Bort	N14-14-24.3	E103-34-5.7	57	*Zea mays*	Pot Danm Neab	Farmer's house	Khmer
269457	48	6-Oct	Oddar Meanchey	Anlong Veng	Tropaing Prey	Srass Chhouk	N14-18-20.7	E104-4-37.7	63	*Capsicum frutescens*	Mate Ach Sath	Farmer's backyard	Khmer
269458	49	6-Oct	Oddar Meanchey	Anlong Veng	Tropaing Prey	Srass Chhouk	N14-18-20.7	E104-4-37.7	63	*Solanum melongena*	Trob Pong Lolok	Farmer's backyard	Khmer
269459	50	6-Oct	Oddar Meanchey	Anlong Veng	Tropaing Prey	Srass Chhouk	N14-18-20.7	E104-4-37.7	63	*Capsicum annuum*	Mate	Farmer's backyard	Khmer
269460	51	6-Oct	Oddar Meanchey	Anlong Veng	Tropaing Prey	Srass Chhouk	N14-18-20.7	E104-4-37.7	63	*Cucurbita moschata*	Lpoa	Farmer's house	Khmer
269461	52	6-Oct	Oddar Meanchey	Anlong Veng	Tropaing Prey	Srass Chhouk	N14-18-20.7	E104-4-37.7	63	*Benincasa hispida*	Trorlach Srov	Farmer's house	Khmer
269462	53	6-Oct	Oddar Meanchey	Anlong Veng	Tropaing Prey	Srass Chhouk	N14-18-23.8	E104-4-40.1	65	*Capsicum frutescens*	Mate Sor	Farmer's backyard	Khmer
269463	54	6-Oct	Oddar Meanchey	Anlong Veng	Tropaing Prey	Srass Chhouk	N14-18-23.8	E104-4-40.1	65	*Solanum melongena*	Trob Sroy	Farmer's backyard	Khmer
269464	55	6-Oct	Oddar Meanchey	Anlong Veng	Tropaing Prey	Srass Chhouk	N14-18-36.2	E104-4-27.5	63	*Luffa cylindrica*	Nonong Krov Orb	Farmer's house	Khmer
269465	56	6-Oct	Oddar Meanchey	Anlong Veng	Tropaing Prey	Srass Chhouk	N14-18-36.2	E104-4-27.5	63	*Cucumis melo*	Tra Sork Srav	Farmer's house	Khmer
269466	57	6-Oct	Oddar Meanchey	Anlong Veng	Tropaing Prey	Chhoeng Phnom	N14-19-12.0	E104-4-32.0	69	*Capsicum frutescens*	Mate Ach Sath	Farmer's backyard	Khmer
269467	58	7-Oct	Oddar Meanchey	Trapeang Prasat	Tror Nob Dach	Chey Nivat	N14-16-24.9	E104-25-25.3	70	*Glycine max*	Sandeak Saing Kro Hon	Farmer's house	Khmer
269468	59	7-Oct	Oddar Meanchey	Trapeang Prasat	Tror Nob Dach	Chey Nivat	N14-16-28.7	E104-25-29.1	79	*Capsicum frutescens*	Mate Ach Sath	Farmer's backyard	Khmer
269469	60	7-Oct	Oddar Meanchey	Trapeang Prasat	Tror Nob Dach	Chey Nivat	N14-16-28.7	E104-25-29.1	79	*Capsicum annuum*	Mate Dai Neang	Farmer's backyard	Khmer
269470	61	7-Oct	Oddar Meanchey	Trapeang Prasat	Tror Nob Dach	Chey Nivat	N14-16-28.7	E104-25-29.1	79	*Lablab purpureus*	Popeay Sbeak	Farmer's backyard	Khmer
269471	62	7-Oct	Oddar Meanchey	Trapeang Prasat	Tror Nob Dach	Chey Nivat	N14-16-28.7	E104-25-29.1	79	*Canavalia gladiata*	Popeay Barang	Farmer's backyard	Khmer
269472	63	7-Oct	Oddar Meanchey	Trapeang Prasat	Tror Nob Dach	Chey Nivat	N14-16-28.7	E104-25-29.1	79	*Psophocarpus tetragonolobus*	Popeay	Farmer's backyard	Khmer
269473	64	7-Oct	Oddar Meanchey	Trapeang Prasat	Tror Nob Dach	Chey Nivat	N14-16-28.7	E104-25-29.1	79	*Abelmoschus esculentus*	Pot Barang	Farmer's backyard	Khmer
269474	65	7-Oct	Oddar Meanchey	Trapeang Prasat	Tror Nob Dach	Chey Nivat	N14-16-28.7	E104-25-29.1	79	*Lagenaria siceraria*	Klok	Farmer's backyard	Khmer
269475	66	7-Oct	Oddar Meanchey	Trapeang Prasat	Tror Nob Dach	Chey Nivat	N14-16-39.6	E104-24-48.5	93	*Capsicum frutescens*	Mate Qutiuvl	Farmer's backyard	Khmer
269476	67	7-Oct	Oddar Meanchey	Trapeang Prasat	Tror Nob Dach	Chey Nivat	N14-16-38.6	E104-25-0.5	94	*Capsicum frutescens*	Mate Ach Sath	Farmer's backyard	Khmer
269477	68	7-Oct	Oddar Meanchey	Trapeang Prasat	Tror Nob Dach	Chey Nivat	N14-16-38.6	E104-25-0.5	94	*Capsicum annuum*	Mate Dai Neang	Farmer's backyard	Khmer
269478	69	7-Oct	Oddar Meanchey	Trapeang Prasat	Tror Nob Dach	Chey Nivat	N14-16-38.6	E104-25-0.5	94	*Momordica charantia*	Marass	Farmer's backyard	Khmer
269479	70	7-Oct	Oddar Meanchey	Trapeang Prasat	Tror Nob Dach	Chey Nivat	N14-16-38.6	E104-25-0.5	94	*Cucurbita moschata*	Lpoa	Farmer's house	Khmer
269480	71	7-Oct	Oddar Meanchey	Trapeang Prasat	Tror Nob Dach	Chey Nivat	N14-16-37.8	E104-25-6.5	93	*Capsicum annuum*	Mate Lev Ouv	Farmer's backyard	Khmer
269481	72	7-Oct	Oddar Meanchey	Trapeang Prasat	Tror Nob Dach	Chey Nivat	N14-16-24.9	E104-25-25.3	70	*Capsicum annuum*	Mate Lev Ouv	Farmer's backyard	Khmer
269482	73	7-Oct	Oddar Meanchey	Trapeang Prasat	Tror Nob Dach	Chey Nivat	N14-16-37.8	E104-25-6.5	93	*Capsicum annuum*	Matess Lek	Farmer's backyard	Khmer
269483	74	8-Oct	Preah Vihear	Chhaeb	Mluprey I	Kdul	N13-48-53.4	E105-16-6.1	71	*Capsicum frutescens*	Mate Dai Neang	Farmer's house	Khmer
269484	75	8-Oct	Preah Vihear	Chhaeb	Mluprey I	Kdul	N13-48-53.0	E105-16-7.1	71	*Capsicum frutescens*	Mate Dai Neang	Farmer's house	Khmer
269485	76	8-Oct	Preah Vihear	Chhaeb	Mluprey I	Kdul	N13-48-52.6	E105-16-14.1	73	*Capsicum annuum*	Mate Laos	Farmer's house	Khmer
269486	77	8-Oct	Preah Vihear	Chhaeb	Mluprey I	Kdul	N13-48-52.6	E105-16-14.1	73	*Capsicum frutescens*	Mate Dai Neang	Farmer's backyard	Khmer
269487	78	8-Oct	Preah Vihear	Chhaeb	Mluprey I	Kdul	N13-48-52.6	E105-16-14.1	73	*Cucumis sativus*	Phor Trosork	Farmer's house	Khmer
269488	79	8-Oct	Preah Vihear	Chhaeb	Mluprey I	Kdul	N13-48-52.6	E105-16-14.1	73	*Cucumis melo*	Tra Sork Srov	Farmer's house	Khmer
269489	80	8-Oct	Preah Vihear	Chhaeb	Mluprey I	Kdul	N13-48-52.6	E105-16-14.1	73	*Solanum melongena*	Trob Sroy	Farmer's backyard	Khmer
269490	81	8-Oct	Preah Vihear	Chhaeb	Mluprey I	Kdul	N13-48-52.6	E105-16-14.1	73	*Solanum melongena*	Trorb Chan	Farmer's house	Khmer
269491	82	8-Oct	Preah Vihear	Chhaeb	Mluprey I	Kdul	N13-48-52.6	E105-16-14.1	73	*Cucurbita moschata*	Lpoa Tru	Farmer's backyard	Khmer

Table 3. (Continued).

JP No	Individual No	Date	Province	District	Commune	Village	Latitude	Longtitude	Altitude (m)	Species name	Local name	Source	Tribe
269492	83	8-Oct	Preah Vihear	Chhaeb	Mluprey Ⅰ	Kdul	N13-48-52.6	E105-16-14.1	73	*Cucurbita moschata*	Lpoa	Farmer's backyard	Khmer
269493	84	8-Oct	Preah Vihear	Chhaeb	Mluprey Ⅰ	Kdul	N13-45-57.8	E105-24-34.1	91	*Capsicum frutescens*	Mate Ach Sath	Farmer's backyard	Khmer
269494	85	8-Oct	Preah Vihear	Chhaeb	Chhaeb Ⅰ	Chheab Lech	N13-45-57.8	E105-24-34.1	91	*Capsicum annuum*	Mate Dai Neang	Farmer's backyard	Khmer
269495	86	8-Oct	Preah Vihear	Chhaeb	Chhaeb Ⅰ	Chheab Lech	N13-45-57.8	E105-24-34.1	91	*Capsicum frutescens*	Matess Klai or Mate Sor	Farmer's backyard	Khmer
269496	87	8-Oct	Preah Vihear	Chhaeb	Chhaeb Ⅰ	Chheab Lech	N13-45-57.8	E105-24-34.1	91	*Cucumis melo*	Tra Sork Srav	Farmer's house	Khmer
269497	88	8-Oct	Preah Vihear	Chhaeb	Chhaeb Ⅰ	Chheab Lech	N13-45-57.8	E105-24-34.1	91	*Cucumis melo*	Tra Sork Srav	Farmer's house	Khmer
269498	89	8-Oct	Preah Vihear	Chhaeb	Chhaeb Ⅰ	Chheab Lech	N13-45-57.8	E105-24-34.1	91	*Zea mays*	Port Ksay or Pot Dam Neab	Farmer's house	Khmer
269499	90	8-Oct	Preah Vihear	Chhaeb	Chhaeb Ⅰ	Chheab Lech	N13-45-57.8	E105-24-34.1	91	*Benincasa hispida*	Trolach	Farmer's house	Khmer
269500	91	8-Oct	Preah Vihear	Chhaeb	Chhaeb Ⅰ	Chheab Lech	N13-45-57.8	E105-24-34.1	91	*Sorghum bicolor*	Um Paw Chey	Farmer's house	Khmer
269501	92	8-Oct	Preah Vihear	Chhaeb	Chhaeb Ⅰ	Chheab Lech	N13-45-57.8	E105-24-34.1	91	*Cucurbita moschata*	Lpoa Vang	Farmer's house	Khmer
269502	93	8-Oct	Preah Vihear	Chhaeb	Chhaeb Ⅱ	Dong Phlat	N13-54-11.0	E105-28-40.5	104	*Capsicum frutescens*	Matess Chma	Farmer's backyard	Khmer
269503	94	8-Oct	Preah Vihear	Chhaeb	Chhaeb Ⅱ	Dong Phlat	N13-54-11.0	E105-28-40.5	104	*Capsicum frutescens*	Matess La add	Farmer's backyard	Khmer
269504	95	8-Oct	Preah Vihear	Chhaeb	Chhaeb Ⅱ	Dong Phlat	N13-54-11.0	E105-28-40.5	104	*Capsicum frutescens*	Mate Sor	Farmer's backyard	Khmer
269505	96	8-Oct	Preah Vihear	Chhaeb	Chhaeb Ⅱ	Dong Phlat	N13-54-11.0	E105-28-40.5	104	*Amaranthus cruentus*	Ptee Dong	Farmer's backyard	Khmer
269506	97	8-Oct	Preah Vihear	Chhaeb	Chhaeb Ⅱ	Dong Phlat	N13-54-11.0	E105-28-40.5	104	*Amaranthus blitum*	Ptee Ach Mann	Farmer's backyard	Khmer
269507	98	8-Oct	Preah Vihear	Chhaeb	Chhaeb Ⅱ	Dong Phlat	N13-54-11.0	E105-28-40.5	104	*Solanum melongena*	Trob Krang	Farmer's backyard	Khmer
269508	99	8-Oct	Preah Vihear	Chhaeb	Chhaeb Ⅱ	Dong Phlat	N13-54-11.0	E105-28-40.5	104	*Cucurbita moschata*	Lpoa	Farmer's house	Khmer
269509	100	8-Oct	Preah Vihear	Chhaeb	Chhaeb Ⅱ	Dong Phlat	N13-54-11.0	E105-28-40.5	104	*Citrullus lanatus*	Awulak	Farmer's house	Khmer
269510	101	8-Oct	Preah Vihear	Chhaeb	Chhaeb Ⅱ	Dong Phlat	N13-54-11.0	E105-28-40.5	104	*Cucumis melo*	Tra Sork Tek Bay	Farmer's house	Khmer
269511	102	8-Oct	Preah Vihear	Chhaeb	Chhaeb Ⅱ	Dong Phlat	N13-54-7.5	E105-27-32.3	101	*Setaria italica*	Ta Poa	Farmer's backyard	Khmer
269512	103	8-Oct	Preah Vihear	Chhaeb	Chhaeb Ⅱ	Dong Phlat	N13-54-7.5	E105-27-32.3	101	*Cucumis melo*	Tra Sork Srav	Farmer's house	Khmer
269513	104	8-Oct	Preah Vihear	Chhaeb	Chhaeb Ⅱ	Dong Phlat	N13-54-7.5	E105-27-32.3	101	*Vigna unguiculata*	San deak Kmoa	Farmer's house	Khmer
269514	105	8-Oct	Preah Vihear	Chhaeb	Chhaeb Ⅱ	Dong Phlat	N13-54-7.5	E105-27-32.3	101	*Vigna unguiculata*	San deak Krohom	Farmer's house	Khmer
269515	106	8-Oct	Preah Vihear	Chhaeb	Chhaeb Ⅱ	Dong Phlat	N13-54-7.5	E105-27-32.3	101	*Vigna umbellata*	San Deak Prey	Farmer's house	Khmer
269516	107	8-Oct	Preah Vihear	Chhaeb	Chhaeb Ⅱ	Dong Phlat	N13-54-7.5	E105-27-32.3	101	*Vigna umbellata*	San Deak Prey	Farmer's house	Khmer
269517	108	8-Oct	Preah Vihear	Chhaeb	Chhaeb Ⅱ	Dong Phlat	N13-54-7.5	E105-27-32.3	101	*Sorghum bicolor*	Um Paw Chey	Farmer's house	Khmer
269518	109	9-Oct	Preah Vihear	Kulen	Thai	Pong Ror	N13-49-23.0	E104-47-30.0	64	*Capsicum frutescens*	Mate Ach Sath	Farmer's backyard	Khmer
269519	110	9-Oct	Preah Vihear	Kulen	Thai	Pong Ror	N13-49-23.0	E104-47-30.0	64	*Capsicum frutescens*	Mate Sor	Farmer's backyard	Khmer
269520	111	9-Oct	Preah Vihear	Kulen	Thai	Pong Ror	N13-49-23.0	E104-47-30.0	64	*Solanum melongena*	Trob Sroy	Farmer's backyard	Khmer
269521	112	9-Oct	Preah Vihear	Kulen	Thai	Pong Ror	N13-49-23.0	E104-47-30.0	64	*Solanum melongena*	Trob Chan	Farmer's backyard	Khmer
269522	113	9-Oct	Preah Vihear	Kulen	Thai	Pong Ror	N13-49-1.9	E104-47-16.0	71	*Solanum melongena*	Trob Sroy	Farmer's backyard	Khmer
269523	114	9-Oct	Preah Vihear	Kulen	Thai	Pong Ror	N13-49-1.9	E104-47-16.0	71	*Solanum melongena*	Trob Sroy	Farmer's backyard	Khmer
269524	115	9-Oct	Preah Vihear	Kulen	Thai	Pong Ror	N13-49-1.9	E104-47-16.0	71	*Cucumis melo*	Tra Sork Srav	Farmer's house	Khmer
269525	116	9-Oct	Preah Vihear	Kulen	Thai	Pong Ror	N13-49-1.9	E104-47-16.0	71	*Cucurbita moschata*	Lpoa Sor At	Farmer's house	Khmer
—	117	9-Oct	Preah Vihear	Kulen	Thai	Pong Ror	N13-49-1.9	E104-47-16.0	71	*Vigna unguiculata*	Son Deak Kour	Farmer's house	Khmer
269526	118	9-Oct	Preah Vihear	Kulen	Thai	Pong Ror	N13-49-1.9	E104-47-16.0	71	*Capsicum frutescens*	Mate Sor	Farmer's backyard	Khmer

JP number of the accession individual No. 117 was not assigned because this accession was not imported from Cambodia to Japan.

Photo 1. Paddy field in Oddar Meanchey Province.

Photo 2. Survey at farmer's house in Oddar Meanchey Province.

Photo 3. Survey at farmer's house in Oddar Meanchey Province.

Photo 4. Investigation on a farm garden in Preah Vihear Province.

Photo 5. Squash and school girls at the surveyed village in Oddar Meanchey Province.

Photo 6. Round shape fruit of chili pepper (*Capsicum annuum*) called "Mate Lev Ouv".

Photos of collected genetic resources samples

No. 1 *Luffa cylindrica*

No. 2 *Cucurbita moschata*

No. 3 *Solanum melongena*

No. 4 *Lagenaria siceraria*

Seeds of No.5 (*Luffa cylindrica*) and No.2 (*Cucurbita moschata*) were stored together in the same plastic bag.

No. 6 (right) *Cucumis sativus*, No. 7 (left) *Citrullus lanatus*

Seeds of No.6 and No.7 were stored together in the same bottle.

No. 8 *Vigna unguiculata* (pod)

No. 8 *Vigna unguiculata* (seeds)

No. 9 *Amaranthus blitum*

No. 10 *Capsicum frutescens*

No. 11 *Capsicum frutescens*

No. 12 *Passiflora foetida*

No. 13 *Capsicum frutescens*

No. 14 *Cucurbita moschata*

No. 15 *Solanum melongena*

No. 17 *Solanum melongena*

No. 18 *Luffa acutangula*

No. 19 *Abelmoschus esculentus*

No. 20 *Solanum torvum*

No. 21 *Cucumis melo*

No. 22 *Cucumis sativus*

No. 26 *Luffa cylindrica* (fruit)

Fruit of No. 26 was as long as the woman in the picture

No. 27 *Luffa cylindrica*

No. 28 *Benincasa hispida*

No. 29 *Capsicum annuum*

No. 30 *Capsicum annuum*

No. 31 *Capsicum annuum*

No.32 *Capsicum frutescens*

No. 33 *Trichosanthes cucumerina*

No. 34 *Amaranthus blitum*

No. 35 *Capsicum frutescens*

No. 36 *Capsicum frutescens*

No. 37 *Psophocarpus tetragonolobus*

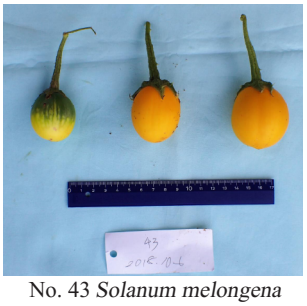
No. 38 *Capsicum frutescens*

No. 39 *Benincasa hispida*

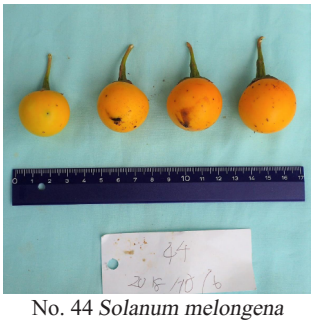
No. 40 *Cucurbita moschata*

No. 41 *Solanum melongena*

No. 42 *Solanum melongena*



No. 43 *Solanum melongena*



No. 44 *Solanum melongena*

No. 45 *Cucurbita moschata*

No. 46 *Capsicum frutescens*

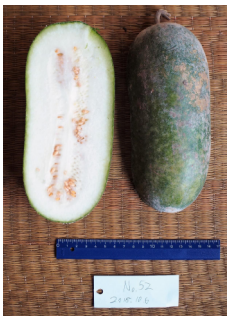
No. 47 *Zea mays*

No. 48 *Capsicum frutescens*

No. 49 *Solanum melongena*

No. 50 *Capsicum annuum*

No. 51 *Cucurbita moschata*



No. 52 *Benincasa hispida*

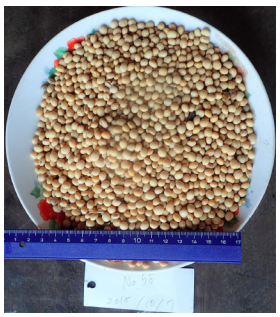
No. 53 *Capsicum frutescens*

No. 54 *Solanum melongena*

No. 55 *Luffa cylindrica*

No. 56 *Cucumis melo*

No. 57 *Capsicum frutescens*



No. 58 *Glycine max*

No. 59 *Capsicum frutescens*

No. 60 *Capsicum annuum*

No. 61 *Lablab purpureus*

No. 62 *Canavalia gladiata*

No. 63 *Psophocarpus tetragonolobus*

No. 64 *Abelmoschus esculentus*

No. 65 *Lagenaria siceraria*

No. 66 *Capsicum frutescens*

No. 67 *Capsicum frutescens*

No. 68 *Capsicum annuum*

No. 69 *Momordica charantia*

No. 70 *Cucurbita moschata*

No. 71 *Capsicum annuum*

No. 72 *Capsicum annuum*

No. 73 *Capsicum annuum*

No. 74 *Capsicum frutescens*

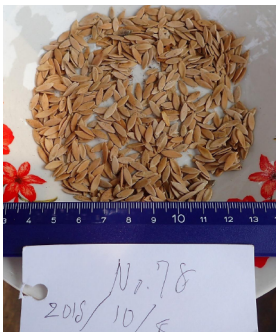
No. 75 *Capsicum frutescens*

No. 76 *Capsicum annuum*
(bulked fruits)

No. 76 *Capsicum annuum*

No. 77 *Capsicum frutescens*
(bulked fruits)

No. 77 *Capsicum frutescens*



No. 78 *Cucumis sativus*

No. 79 *Cucumis melo*

No. 80 *Solanum melongena*

No. 81 *Solanum melongena*
(whole fruit)

No. 81 *Solanum melongena*
(seeds)

No. 82 *Cucurbita moschata*
(whole fruit)

No. 82 *Cucurbita moschata*
(vertical section of fruit)

No. 83 *Cucurbita moschata* (whole fruit)


No. 83 *Cucurbita moschata* (vertical section of fruit)

No. 84 *Capsicum frutescens*

No. 85 *Capsicum annuum*

No. 86 *Capsicum frutescens*


No. 87 *Cucumis melo*


No. 88 *Cucumis melo*


No. 89 *Zea mays*


No. 90 *Benincasa hispida*

No. 91 *Sorghum bicolor*


No. 92 *Cucurbita moschata*

No. 93 *Capsicum frutescens*

No. 94 *Capsicum frutescens*

No. 95 *Capsicum frutescens*

No. 96 *Amaranthus cruentus*

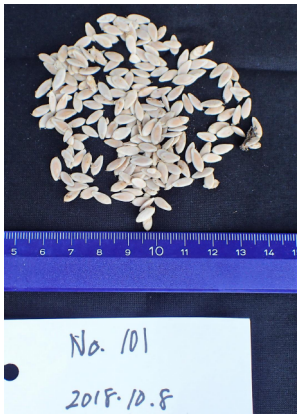
No. 97 *Amaranthus blitum*

No. 98 *Solanum melongena* (whole fruit)

No. 98 *Solanum melongena* (cross-section of a fruit)

No. 99 *Cucurbita moschata*

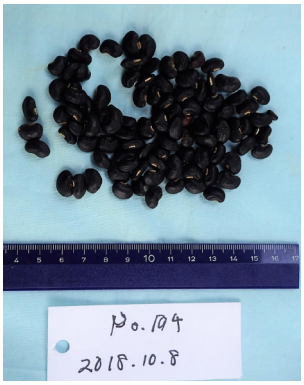
No. 100 *Citrullus lanatus*



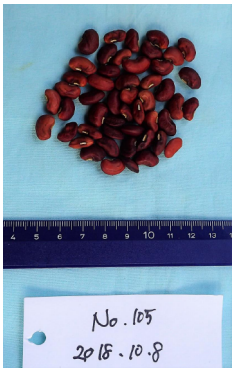
No. 101 *Cucumis melo*

No. 102 *Setaria italica*

No. 103 *Cucumis melo*



No. 104 *Vigna unguiculata*



No. 105 *Vigna unguiculata*

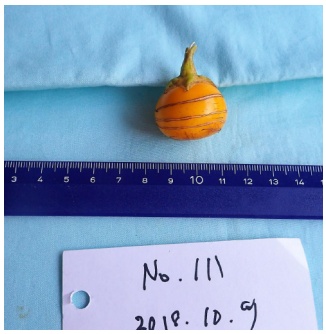
No. 106 (left), No. 107 (right) *Vigna umbellata*

No.104 (lower left) and No.105 (upper left) *Vigna unguiculata*, No.106 (upper right) and No.107 (lower right) *Vigna umbellata*

No. 108 *Sorghum bicolor*

No. 109 *Capsicum frutescens*

No. 110 *Capsicum frutescens*



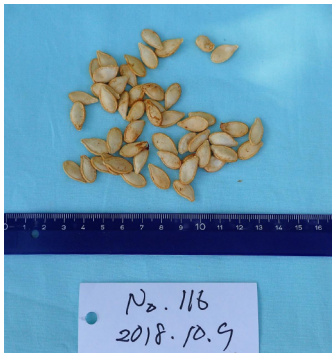
No. 111 *Solanum melongena*


No. 112 *Solanum melongena*


No. 113 *Solanum melongena*


No. 114 *Solanum melongena*

No. 115 *Cucumis melo*



No. 116 *Cucurbita moschata*

Seeds of No.115 and No.116 were stored together in the same bottle.

No. 117 *Vigna unguiculata*

No. 118 *Capsicum frutescens*